

Application Number 10/539188
Response to the Office Action dated February 19, 2008

REMARKS

Favorable reconsideration of this application is requested in view of the following remarks.

Claim 1 has been amended as supported by original claim 4, the specification at page 10, 2nd paragraph, page 12, last paragraph, page 13, last paragraph – page 14, line 5, page 25, 2nd paragraph (starting with “As described above...”), and page 33, 3rd and 4th (industrial applicability) paragraphs in addition to editorial revisions; accordingly, claim 4 has been canceled without prejudice; claim 5 has been amended to refer to claim 1; and claims 6, 7, 8, and 11 have been amended editorially.

Claim 13 has been added as supported by the specification at page 12, last paragraph – page 13, line 1.

Claim 1 has been rejected under 35 U.S.C. 112, second paragraph, as being indefinite. Applicants respectfully traverse this rejection.

Claim 1 has been amended to clarify the alkyl groups of R^1 and R^2 and an aralkyl group of R^1 relative to the optional presence of a double bond and/or triple bond. Therefore, the claim is definite, and this rejection should be withdrawn.

Claims 1-10 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Dingwen et al. (Japanese Patent Announcement No. S45-17402, Patent No. 592,324) in view of Kato et al. (U.S. Patent No. 4,874,890). Applicants respectfully traverse this rejection.

Dingwen discloses a deuteration process in the presence of a deuterated solvent (D_2O), alkaline metal deuteroxide ($NaOD$), a reduced Adams catalyst ($PtO_2.H_2O$), which is reduced by D_2 gas, and D_2O_2 (see coln. 2, lines 13-19; coln. 3, (A)-(C) in example 1; and tables 1-3). Accordingly, the reaction is carried out under a severe condition, i.e., a basic condition with D_2O_2 . Under such severe conditions, the substrate compound would be decomposed, and removing such decomposed materials requires a complicated

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purification process (see page 2, para. 2-1) of the specification). In contrast, claim 1 does not require the alkaline metal deuterioxide or D_2O_2 , and the process is conducted under a neutral condition using a deuterated solvent as a source of heavy hydrogen. In addition, the process of claim 1 effectively can deuterate a substrate compound that has a carbon-carbon double or triple bond such as methacrylic acid because the catalyst is activated before the deuteration reaction and the compound such as methacrylic acid does not contact and accordingly, react with H_2 or D_2 gas that is used for activation of the catalyst (see examples 26-32 in table 3 and page 33, 1st para. of the specification). The reference, however, discloses that the deuteration reaction is conducted by adding a substrate compound, D_2O , NaOD, and D_2O_2 into the reactor (see coln. 4, (C) 1st para.) in which the catalyst is activated with D_2 gas. When the compound having a carbon-carbon double or triple bond contacts D_2 gas, the double or triple bond is hydrogenated (see comparative example 2 at page 32 of the specification), and a purification process that removes such by-products would be necessary. Moreover, in claim 1, when the compound has no carbon-carbon double nor triple bond, the catalyst may be activated simultaneously during the deuteration of the compound, i.e., the deuterated compound can be obtained by a one-step method. Dingwen, however, needs two steps because the reference activates the catalyst, and then, adds a substrate compound, D_2O , NaOD, and D_2O_2 into the reactor for deuteration as discussed above. Accordingly, claim 1 is distinguished from Dingwen.

The Examiner refers to Kato, which discloses use of D_2 gas (see coln. 2, lines 5-9, coln. 2, direct substitution process, and coln. 3, examples 1 and 3) that Dingwen does not, because under original claim 1 of the present application D_2 gas could be used as a source of heavy hydrogen and the specification discloses such use (see page 10, 2nd para.). Because current claim 1 limits the source of heavy hydrogen to a deuterated solvent and Dingwen discloses use of D_2O as discussed above, those skilled in the art are not motivated to combine Dingwen with Kato in this respect.

Accordingly, this rejection should be withdrawn. Applicants do not concede the correctness of the rejection.

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Claims 1, 2, and 4-10 have been rejected under 35 U.S.C. 102(b) as being anticipated by Kato et al. (U.S. Patent No. 4,874,890). Applicants respectfully traverse this rejection.

Applicants respectfully note that "Carney et al." is mentioned in the Office Action but is not identified. Therefore, Applicants assume this was an error and this reference is not referred to in this response.

Claim 4 has been canceled, and the content of claim 4 has been included in claim 1. Claim 1 of the present application requires use of the activated catalyst, and when a substrate compound includes a carbon-carbon double or triple bond, the catalyst must be activated before the deuteration. The Kato reference discloses only substrate compounds that have a carbon-carbon double bond such as methyl acrylate and methyl methacrylic acid (see coln. 1, field of invention; coln. 2, lines 5-9; coln. 2, line 68 – coln. 3, line 2; and claim 1). Kato, however, fails to disclose activation of the catalyst and accordingly, does not disclose the activation of the catalyst before deuteration although the substrate compounds have a carbon-carbon double. As shown in comparative example 1 of the specification, the deuteration rate when using non-activated catalyst is significantly lower than the rate when using the activated catalyst (see table 3 at page 31 and comparative example 1 at page 32 of the specification). In addition, Kato discloses use of D₂O and D₂ for the deuteration reaction (see coln. 2, lines 5-9). When D₂ co-exists with a substrate compound that has a carbon-carbon double or triple bond such as methyl acrylate and methylmethacrylic acid, the carbon-carbon double or triple bond is hydrogenated, i.e., reduced, by D₂ (see comparative example 2 at page 32 of the specification), and a purification process that removes such by-products would be necessary. In contrast, in claim 1, when the substrate compound having a carbon-carbon double or triple bond is deuterated, the active catalyst has been activated before the use for the deuteration reaction, and accordingly, H₂ or D₂ does not co-exist with the substrate compound, and no hydrogenation of the double or triple bond of the compound occurs. Claim 13 supports this condition. Therefore, under claim 1, the aimed deuterated compound can be obtained without the purification process. Accordingly, claim 1 is distinguished from Kato, and the rejection should be withdrawn.

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Claims 1, 2, and 4-10 have been rejected under 35 U.S.C. 102(b) as being anticipated by Kiuru et al. (Deuteration of estrogens using Pd/C as a catalyst, Synthesis and Applications of Isotopically Labeled Compounds 1997, 475-477). Applicants respectfully traverse this rejection.

Kiuru discloses a method of a selective catalytic reduction of hydrogen atoms using D₂ and Pd/C (see Abstract and 1st para. of discussion and conclusions at page 475) and fails to disclose use of a deuterated solvent as a source of heavy hydrogen and use of an activated catalyst. In contrast, claim 1 requires exchange of hydrogen atoms in a substrate compound with heavy hydrogen atoms of a deuterated solvent using an activated catalyst. As discussed above, the deuteration rate when using non-activated catalyst is significantly lower than the rate when using the activated catalyst (see table 3 at page 31 and comparative example 1 at page 32 of the specification). In addition, when D₂ co-exists with a substrate compounds having a carbon-carbon double or triple bond, these bonds are hydrogenated by D₂ as discussed above (see comparative example 2 at page 32 of the specification). Further, in the reference, the deuteration occurs only at the benzylic positions (see schemes 1 and 2). In contrast, claim 1 does not limit the position of hydrogen atoms to be deuterated. Therefore, claim 1 is distinguished from the reference, and the rejection should be withdrawn.

In view of the above, Applicants request reconsideration of the application in the form of a Notice of Allowance.



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DPM/my/ad

Respectfully submitted,

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